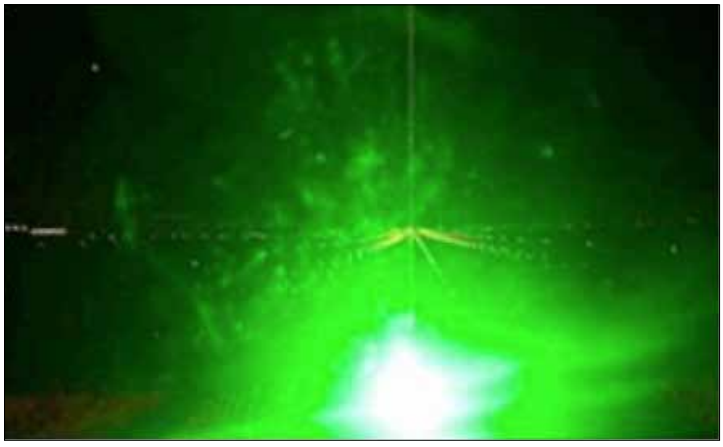
Dealing with the laser dazzle hazard in aviation safety



Pilots view on landing when a green 532 nm laser is shined into the cockpit.

Reports of green laser pointers (532 nm wavelength) being pointed at aircraft are becoming a common event. These sources often prove to be Class 3B and have the capability to permanently damage a persons sight over a range (the Nominal Ocular Hazard Distance) of a few tens of metres or more (see 'Reflections on laser injuries by overpowered laser pointers' in TLU (2011) 62, p14). Whilst aircraft exposure is generally at distances well beyond the NOHDs of such hand held devices, the dazzle hazard remains a major concern. Pilots report having to cover their eyes and others to taking evasive action.

Examples include a cargo plane from Aberdeen being forced to drop 400 ft as it approached the runway to avoid a green beam. An EasyJet Airbus carrying 59 passengers and six crew travelling on the same flightpath from Stansted was targeted 30 minutes later. Both pilots were dazzled by the beam, suffering a temporary loss of vision, and were forced to cover their eyes at a crucial point in the descent. Then in March this year two adults were arrested after a laser was aimed at a commercial plane near Midway Airport in Chicago. A police helicopter sent to investigate was also illuminated.

It is clear that sudden exposure to laser radiation during a critical phase of flight, such as on approach to landing or departure can distract or disorient a pilot and cause temporary visual impairment. Furthermore, flight simulator studies have shown that adverse visual effects from laser exposure are especially debilitating when the eyes are adapted to the low-light level of a cockpit at night. Recovery of visual performance after such a laser light exposure may take from a few seconds to several minutes. This effect could be even worse for example when the glass canopy of a Helicopter is illuminated by green laser. Apart from the obvious distraction of such a flash, the three most commonly reported physiological effects associated with green laser exposures are:

- Glare
  Visual blocking of an object in a person's field of vision due to a bright light source located near the same line of sight.
- Flashblindness
  Temporary loss of vision after the source of illumination has been removed.
- Afterimage
  A transient image left in the visual field after an exposure to a bright light.

Laser protection filters for infrared laser applications with good visible light transmission are relatively easy to design because the wavelengths to be blocked are outside of the visible spectrum. The 532 nm wavelength emitted by green lasers, however is in the centre and most sensitive part of the human Photopic region making filter design more of a challenge.

Brinell Vision has developed a laser safety filter technology which allows the user to see a completely balanced colour view while totally blocking laser light at 532 nm. As shown in the graph below, this filter technology effectively removes the transmission around 532 nm while at the same time offering outstanding visible light transmission when compared with other types of 532 nm blocking technologies: these other types use absorbing materials which generally remove all the blue and a significant amount of green from the visible spectrum. This can make the eyewear completely unsuitable for flying or in fact operating any piece of important equipment.

The Brinell CN-Green advanced filter technology is already being utilised by world leading optics and laser companies in demanding applications such as medical surgery and astronomy.

Equally well, green-beam applications in industry and research can benefit from this technology. These high durability advanced thin film interference filters with low absorbing design to work with high powered laser sources and are available at blocking levels from OD3 - OD6

Brinell filters are custom designed and UK manufactured. They are available in a large range of frame-styles from PROTECT Laserschutz GmbH

For more information about advanced laser protection solutions:

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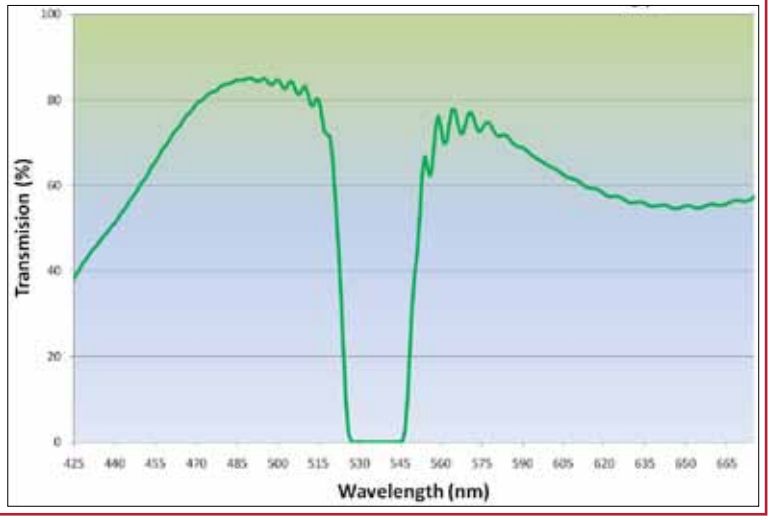

A Brinell CN-Green filter with high blocking levels for 532 nm